

WHAT IS CLAIMED IS:

- 1 1. A biological agent detection apparatus, comprising:
2 a substrate;
3 an array of two or more sensors arranged on the substrate, wherein at least a
4 first one of the sensors includes a sensing element configured to detect a biological agent; and
5 a processing module directly coupled to each of the sensors and configured to
6 process signals received from the two or more sensors to produce an output signal.
- 1 2. The apparatus of claim 1, wherein the processor is configured to
2 execute a first process that detects a change in an environmental condition, and a second
3 process that identifies an origin of the change in the environmental condition.
- 1 3. The apparatus of claim 2, wherein the second process includes a
2 pattern recognition algorithm.
- 1 4. The apparatus of claim 1, further including a communication module
2 configured to provide the output signal to an external intelligence device.
- 1 5. The apparatus of claim 4, wherein the communication module includes
2 one of a wireless interface and a physical bus interface for communicating with the external
3 intelligence device.
- 1 6. The apparatus of claim 4, further including:
2 a power module for supplying power to the detection apparatus; and
3 a pick-up antenna, wherein the power is supplied by an external RF field
4 received by the antenna.
- 1 7. The apparatus of claim 1, further including a communication module
2 configured to provide information to a user in response to the output signal having a value at
3 or above a threshold value.
- 1 8. The apparatus of claim 7, wherein the communication module includes
2 one of a LED, speaker, buzzer and vibration mechanism.
- 1 9. The apparatus of claim 5, wherein the wireless interface device
2 includes one of an RF transmitter, an RF transceiver, an IR transmitter and an IR transceiver.

1 10. The apparatus of claim 5, wherein the physical bus interface includes
2 one of an RS-232 port, a USB port and a Firewire port.

1 11. The apparatus of claim 1, wherein at least two of the sensors are
2 polymer composite sensors.

1 12. The apparatus of claim 1, wherein at least a second one of the sensors
2 is a chemical sensor.

1 13. The apparatus of claim 1, wherein the sensing element of the first
2 sensor is selected from the group consisting of a polymer composite sensor, a surface
3 modified carbon black sensor, a sol-gel encapsulated enzyme, a biopolymer, a self
4 assembling monolayer, an intrinsically conducting polymer, a carbon nanotube composite, a
5 nanogold composite and a nanoscale polymer composite.

1 14. The apparatus of claim 1, wherein the apparatus has a dimension of
2 less than about 4 square inches.

1 15. The apparatus of claim 1, wherein the apparatus has a dimension of
2 less than about 1 square inch.

1 16. The apparatus of claim 1, wherein the sensors and the processing
2 module are integrated on the substrate.

1 17. The apparatus of claim 1, further including an attachment mechanism
2 for allowing a user to wear the apparatus.

1 18. The apparatus of claim 17, wherein the attachment mechanism
2 includes one of a clip and a pin.

1 19. The apparatus of claim 1, wherein the sensing element of the first
2 sensor is an intrinsically conducting polymer selected from the group consisting of
3 polyaniline and polythiophene.

1 20. The apparatus of claim 1, wherein the apparatus is used to diagnose a
2 disease or determine a biological agent based on sampling the atmosphere or a bodily fluid.

1 21. The apparatus of claim 1, wherein a second one of the sensors includes
2 a sensing element configured to detect a biological element different from the biological
3 agent detectable by the first sensor.

1 22. The device of claim 21, further comprising a communication module
2 configured to communicate with an external processor.

1 23. The device of claim 22, wherein the communication module includes a
2 wireless transmitter device.

1 24. The device of claim 23, wherein the wireless transmitter device
2 includes one of an RF transmitter and an IR transmitter.

1 25. A sensor system, comprising
2 a plurality of sensing devices, each device including an array of two or more
3 sensors arranged on a substrate and a wireless communication module for remote
4 communication; and
5 a central processing node, located remote from said sensing devices, including
6 a processing module and a communication module, said node being configured to receive and
7 process signals from the plurality of sensing devices.

1 26. The system of claim 25, wherein at least a first one of said sensing
2 devices includes a polymer composite sensor.

1 27. The system of claim 25, wherein each of said sensing devices includes
2 a polymer composite sensor.

1 28. The system of claim 25, wherein at least a first one of said sensing
2 devices includes a sensor configured to detect a biologic agent.

1 29. The system of claim 25, wherein at least a first one of said sensing
2 devices includes a sensor configured to detect a chemical agent.

1 30. The system of claim 25, wherein each sensing device includes a power
2 source selected from the group consisting of a battery, a solar cell, an RF tag module and an
3 IR tag module.

1 31. The apparatus of claim 25, wherein at least one sensing device includes
2 a power source selected from one of an RF tag module and an IR tag module, and wherein
3 the communication module of the central processing node includes one of a corresponding
4 RF or IR transceiver for sending a corresponding RF or IR activation signal to the at least one
5 sensing device and for receiving an information signal from the at least one sensing device.

1 32. The system of claim 25, wherein at least a first sensing device is
2 selected from the group consisting of a polymer composite sensor, a surface modified carbon
3 black sensor, a sol-gel encapsulated enzyme, a biopolymer, a self assembling monolayer, an
4 intrinsically conducting polymer, a carbon nanotube composite, a nanogold composite and a
5 nanoscale polymer composite.

1 33. The system of claim 25, wherein at least a first sensing device includes
2 an intrinsically conducting polymer selected from the group consisting of polyaniline and
3 polythiophene.